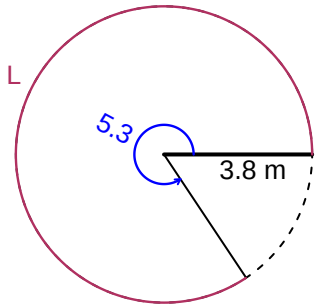
Name: Date:

Trig Final (Solution v17)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 5.3 radians. The radius is 3.8 meters. How long is the arc in meters?

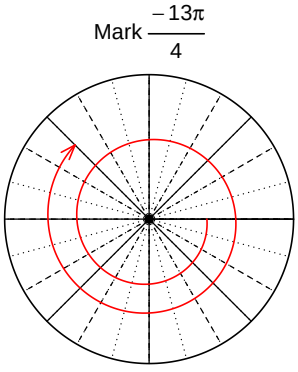


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

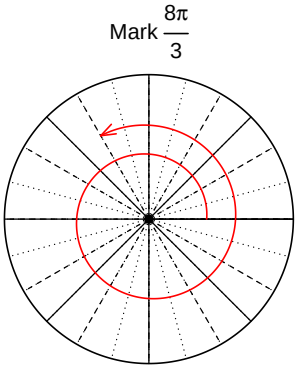
$L = 20.14$ meters.

Question 2

Consider angles $\frac{-13\pi}{4}$ and $\frac{8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-13\pi}{4}\right)$ and $\cos\left(\frac{8\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(-13\pi/4)$



Find $\cos(8\pi/3)$

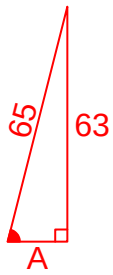
$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(8\pi/3) = \frac{-1}{2}$

Question 3

If $\sin(\theta) = \frac{63}{65}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

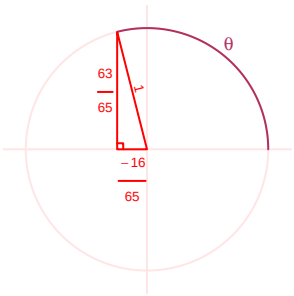
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 63^2 = 65^2$$
$$A = \sqrt{65^2 - 63^2}$$
$$A = 16$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{63}{65}}{\frac{-16}{65}} = \frac{-63}{16}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 5.35 Hz, a midline at $y = -2.31$ meters, and an amplitude of 3.53 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 3.53\sin(2\pi 5.35t) - 2.31$$

or

$$y = 3.53\sin(10.7\pi t) - 2.31$$

or

$$y = 3.53\sin(33.62t) - 2.31$$